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# More on General Theory of Relativity vs. Special Theory of Relativity, Absolute Theory of Relativity, Parameterized Special Theory of Relativity, and NonInertial MultiRelativity

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**Abstract**

This paper continues and completes the analyses from paper [1]. The distinction between Special Relativity (SR) and General Relativity (GR) essentially boils down to whether gravity and acceleration are included in the math calculation. Also, distinctions between General Theory of Relativity vs. Smarandache's Relativities developed between 1972-1983 (Absolute Theory of Relativity, Parameterized Special Theory of Relativity, and NonInertial MultiRelativity) are emphasized. In addition, less known Relativistic Paradoxes [3] are brought to life.
Both SR and GR were developed by Albert Einstein in 1905 and 1915 respectively.

**Keywords:** Special Relativity; General Relativity; NonInertial MultiRelativity.

## 1 | Introduction

Here is the breakdown of their differences:

### 1.1 | Scope and Framework

- **Special Relativity:** Focuses on physics in "flat" spacetime. It applies to objects moving at constant high speeds (inertial frames) and establishes that the laws of physics are the same for all non-accelerating observers.
- **General Relativity:** Expands the theory to include "curved" spacetime. it covers accelerating objects and provides the modern description of gravity.

### 1.2 | The Role of Gravity

- **Special Relativity:** Does **not** include gravity. It treats space and time as a fixed, four-dimensional fabric called **spacetime** that isn't affected by the matter within it.
- **General Relativity:** Proposes that gravity is not a "force" in the traditional sense, but rather the **warping of spacetime** caused by mass and energy. Massive objects like stars "dent" the fabric, and smaller objects follow those curves.

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## 1.3 | Key Concepts and Postulates

| Feature | Special Theory of Relativity (1905) | General Theory of Relativity (1915) |
|---|---|---|
| **Primary Focus** | Speed of light and time dilation. | Gravity and the geometry of space. |
| **Key Constant** | The speed of light ($c$)is constant for all observers. | The Equivalence Principle (gravity is indistinguishable from acceleration). |
| **Spacetime** | Flat Minkowski spacetime. | Curved Pseudo-Riemannian manifold. |
| **Famous Equation** | $E = mc^2$ | $G_{\mu\nu} + \Lambda g_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu}$ (Einstein Field Equations). |

## 1.4 | Real-World Effects

- **SR Effects:** Includes **Time Dilation** (time slows down as you move faster) and **Length Contraction** (objects shorten in the direction of motion).
- **GR Effects:** Includes **Gravitational Time Dilation** (time moves slower near a massive body) and the bending of light by gravity (**Gravitational Lensing**).

**Comparisons** between:

- **General Theories of Relativity vs. Absolute Theory of Relativity,**
- **General Theories of Relativity vs. Parameterized Special Theory of Relativity,**
- **General Theories of Relativity vs. NonInertial MultiRelativity.**

Here is a comparison between Einstein's General Theory of Relativity (GTR/GR) and the alternative frameworks proposed by Florentin Smarandache:

## 1.5 | General Theory of Relativity vs. Absolute Theory of Relativity (ATR)

The Absolute Theory of Relativity is primarily a counterproposal to Einstein's Special Theory (STR), but it differs from General Relativity in several fundamental ways:

- **Space and Time:** General Relativity describes spacetime as a relative, four-dimensional fabric that is curved by mass. ATR posits that space and time are absolute.
- **Speed Limit:** General Relativity adheres to the speed of light ($c$) as a fundamental limit for matter and information. ATR assumes there is no speed barrier in the universe, making superluminal speeds theoretically possible.
- **Gravity and Acceleration:** General Relativity explains gravity through the curvature of spacetime. ATR discards the Lorentz factor and relativistic paradoxes, focusing instead on a vectorial (classical Newtonian) addition of velocities.

## 1.6 | General Theory of Relativity vs. Parameterized Special Theory of Relativity (PSTR)

PSTR is a *meta-theory* that generalizes relativistic concepts using a parameter, $\tau$, which represents the ratio of elapsed time between frames.

- **Framework Nature:** While General Relativity is a specific theory of gravity and curved spacetime, PSTR is a generalized study of the light clock experiment that does not make initial assumptions about the nature of space/time or ultimate speeds.

- **Flexibility:** PSTR can encompass Einstein's Special Relativity as a subset (when $\tau$ is the inverse Lorentz factor), but it also allows for "opposite time dilation" or absolute time, which are concepts not found in the fixed framework of General Relativity.
- **Mathematical Approach:** General Relativity relies on the *Einstein Field Equations* to describe gravity. PSTR uses the $\tau$ parameter to determine time dilation and length contraction results across a continuum of potential "relativities".

## 1.7 | General Theory of Relativity vs. NonInertial MultiRelativity (NIMR)

NIMR is the most generalized framework in this group and shares the most conceptual ground with General Relativity, though it extends the analysis further.

- **Scope of Motion:** General Relativity often focuses on gravity as spacetime curvature or frames under constant acceleration. NIMR studies multiple reference frames moving along arbitrary 3D curves with **non-constant** accelerations.
- **Reference Frames:** NIMR proposes a "chained system" of multiple frames (e.g., a planet orbiting a sun, which orbits a galactic center), aiming to transform measurements across these complex, non-linear paths.
- **Geometric Basis:** While General Relativity is based on Riemannian geometry to model gravity, NIMR suggests a potentially generalized Riemannian geometry that is dependent on the specific acceleration history of the frames involved.
- **Equivalence Principle:** Smarandache questions the Weak and Strong Equivalence Principles of General Relativity, suggesting that constant acceleration is not truly equivalent to heterogeneous gravity.

## 1.8 | Paradoxes Related to the Special Theory of Relativity (STR)

In our research [3], we identify and analyze several "New Relativistic Paradoxes" that challenge the foundations of both the Special Theory of Relativity (STR) and the General Theory of Relativity (GTR).

Smarandache identifies inconsistencies in the STR's reliance on the Lorentz factor and the constancy of the speed of light [2, 3]:

- **The Rotational Twin Paradox:** Challenges the traditional twin paradox by applying it to rotational motion.
- **Length Contraction Independent of Time:** Smarandache notes that it is abnormal for an object to shrink by the same factor regardless of whether it flies for one second or one year.
- **The Breaking of Rigid Bodies:** He argues that if rigid bodies truly shrank as proposed by STR, they would break under the physical stress.
- **Miraculous Restoration:** He questions the "miraculous" return of objects to their original length and mass immediately upon stopping.
- **Relativistic vs. Absolute Mass:** Smarandache challenges the source of "extra mass" in relativistic mass increases.
- **Symmetry and Asymmetry of Time Dilation:** He points out that STR inconsistently supports symmetry in some examples of time dilation but asymmetry in others.

## 1.9 | Paradoxes Related to the General Theory of Relativity (GTR)

Our criticisms [3] of GTR focus on its foundational principles of gravity and equivalence:

- **The Weak Equivalence Principle (WEP) Paradox:** We suggest the WEP is not fully equivalent at the macrolevel and questions its validity at the quantum level.
- **Acceleration vs. Heterogeneous Gravity:** We argue that constant acceleration is not truly equivalent to heterogeneous gravity, challenging the Einsteinian core of GTR.
- **Imaginary Space and Field Equations:** We posit that Einstein's Field Equations and Pseudotensors may only be valid in an "imaginary space" rather than physical reality.
- **Space Curvature and Medium Lensing**: We propose that light bends near massive bodies not due to "spacetime curvature," but due to Medium Lensing (refraction based on the medium's composition and density).
- **The Expansion of the Universe:** We question the logic of Hubble's Law, noting that if the universe is expanding (moving), then according to relativity, it should also be contracting.

That's why we have proposed the Absolute Theory of Relativity (ATR) as a solution, which discards these paradoxes by assuming absolute space, absolute time, and no universal speed limit.

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## Data Availability

The datasets generated during and/or analyzed during the current study are not publicly available due to the privacy-preserving nature of the data, but are available from the corresponding author upon reasonable request.

## Conflicts of Interest

The authors declare that there is no conflict of interest in the research.

## Ethical Approval

This article does not contain any studies with human participants or animals performed by any of the authors.

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